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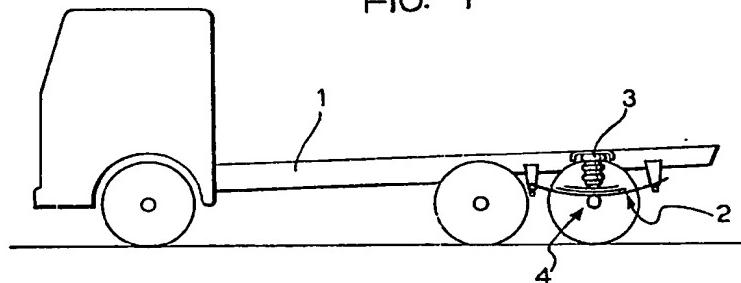
(56) Documents cited
GB A 2138368 US 3730549
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(58) Field of search
B7D

(54) Device for raising a supplementary dead axle of a commercial vehicle

(57) Fluid suspension springs (3) and mechanical springs (2) are interposed between a supplementary dead axle (4) and the chassis (1) of a lorry. The mechanical springs (2), preferably leaf springs, act in the sense of raising the axle (4). The fluid springs (3), preferably air springs, have associated pressure release means for allowing the mechanical springs (2) to raise the axle (4), and pressurising means for lowering the axle against the action of the mechanical springs.

FIG. 1



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FIG. 1

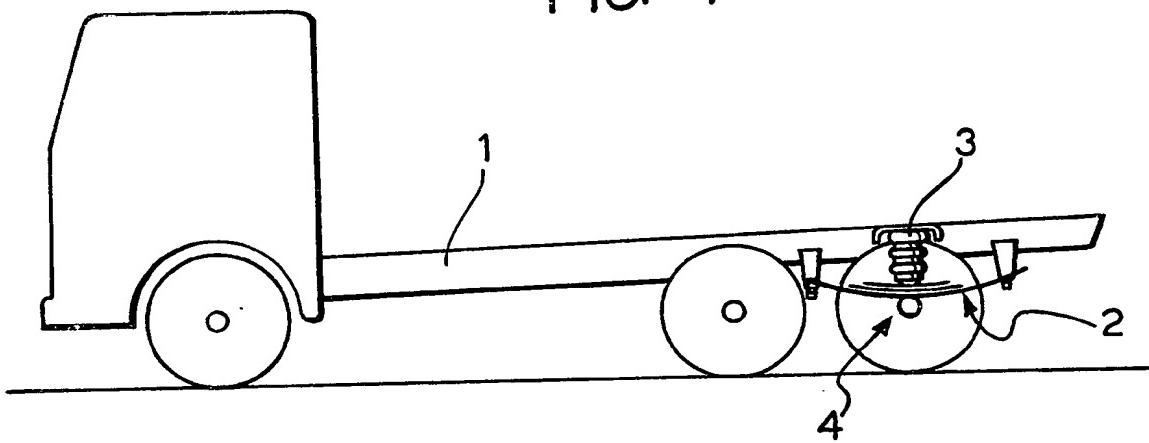


FIG. 2

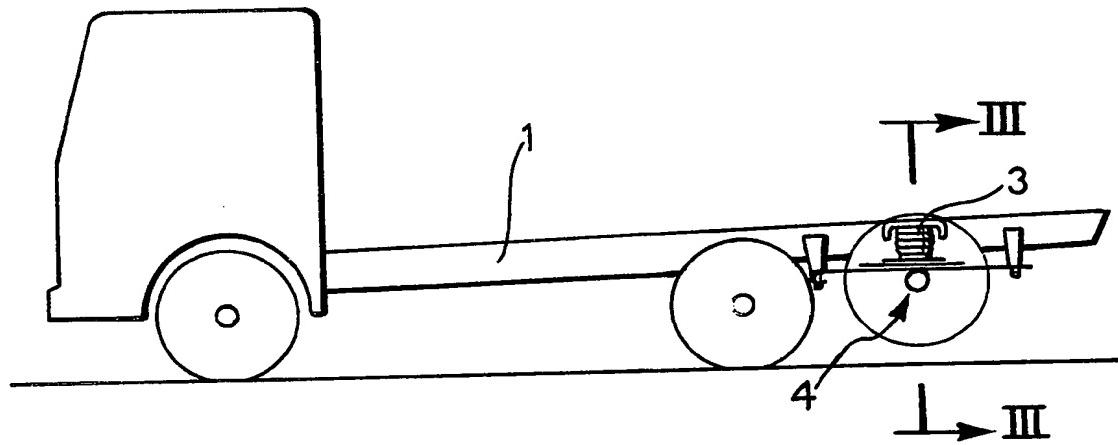
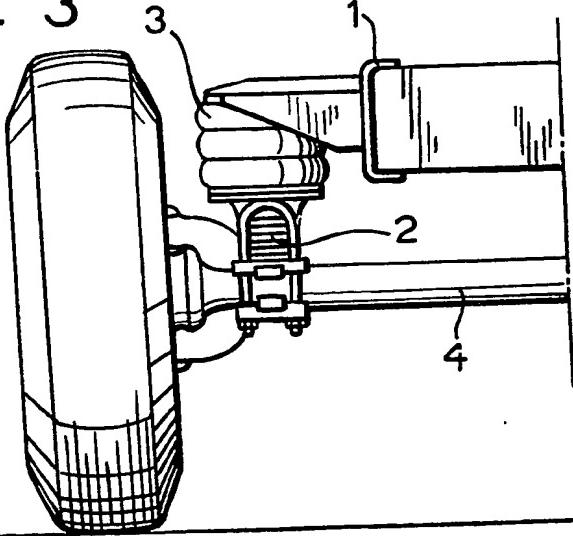


FIG. 3



SPECIFICATION**Device for raising a supplementary dead axle of a commercial vehicle**

5 The present invention relates to a device for raising a supplementary dead axle of a commercial vehicle, of the type in which fluid suspension springs are interposed between the supplementary axle 10 and the chassis of the vehicle.

Supplementary dead axles are usually fitted in front of or behind the driving axle or axles of lorries.

According to the current legal requirements, the 15 raising of the supplementary axle is used to increase the adhesive weight under particular ground conditions.

The raising devices used for this purpose up to now include pneumatic cylinders or air springs 20 which act on tie rods connected to the axle to be raised, either directly or through levers rotatable about a shaft transverse the vehicle. In these devices, the action of the pneumatic cylinders or air springs serves to nullify the action of the leaf 25 springs or other resilient members, such as fluid springs, forming part of the suspension of the vehicle. Usually, the suspension is of the mixed type with leaf springs and air springs.

The known raising devices are very complex and 30 expensive to manufacture, and the object of the invention is to provide a raising device which is simpler and cheaper in its conception but has functional characteristics better than or equal to those of the devices of the prior art.

35 According to the present invention, this object is achieved by means of a raising device of the aforesaid type, wherein mechanical springs which act in the sense of raising the supplementary axle are also interposed between the supplementary axle 40 and the chassis of the vehicle, and wherein the fluid springs have associated pressure release means for allowing the mechanical springs to raise the axle, and pressurising means for lowering the axle against the action of the mechanical springs.

45 Preferably, the mechanical springs are leaf springs and the fluid springs are air springs.

By virtue of this solution, the contraction and expansion of the fluid suspension springs are used to raise and lower the supplementary axle.

50 An advantageous characteristic of the device according to the invention lies in the fact that the mechanical springs, which act in the opposite sense to usual, avoid the need for a valve for regulating the pressure in the fluid springs upon variations of the trim of the vehicle: when the

supplementary axle is lowered, the smaller the load on the vehicle the more the fluid springs are contracted by the action of the mechanical springs which, under these conditions, are heavily loaded 60 in that the vehicle is relatively high off the road.

The greater the load on the vehicle, however, the closer the vehicle is to the road and the mechanical springs, being unloaded, take little load from the air suspension.

65 This type of behaviour is advantageous in that

the more the vehicle is loaded the less leaf springs or other mechanical springs constituting the elements for connecting the supplementary axle to the chassis are stressed.

70 The pressure in the fluid springs will be adjusted initially according to the load which the supplementary axle will have to support.

The invention will now be described, by way of example, with reference to the accompanying

75 drawings, in which:

Figure 1 is a schematic longitudinal view of a vehicle provided with a raising device for its supplementary dead axle, according to a preferred embodiment of the invention, with the supplementary axle lowered;

Figure 2 is a view similar to *Figure 1*, with the supplementary axle raised, and

Figure 3 is a half-cross-section of the vehicle, taken on the line III-III of *Figure 2* on an enlarged scale.

80 The drawings show a lorry of which one of the chassis side members is indicated 1 and a supplementary dead axle is indicated 4. A mechanical spring 2 and a fluid suspension spring 3 are interposed between the supplementary axle 4 and each chassis side member 1. The mechanical springs 2 are preferably leaf springs, and the fluid springs 3 can be air springs (as shown) or hydraulic springs.

85 The leaf springs 2 constitute the members which fix the axle 4 to the chassis members 1 and differ from conventional suspensions in that they are made to act upwardly, tending to raise the axle 4. In *Figure 1*, the action of the mechanical springs 2 is opposed by the fluid springs 3, which contain air or other pressurised fluid.

90 In order to move the supplementary axle 4 from the lowered position of *Figure 1* to the raised position of *Figure 2*, it is necessary to release the pressure from the fluid springs 3 so that the mechanical springs 2 can act upwardly.

95 In order to return the supplementary axle 4 to the lowered position of *Figure 1*, it is necessary to pressurise the fluid springs 3 so as to overcome the action of the mechanical springs 2 and support 100 the expected load on the axle 4.

105 As already stated above, the device according to the invention does not require pressure regulating valves: only pressure release means and pressurising means are necessary to move the axle 4, and these may consist simply of a three-way valve connecting the springs 3 selectively to a source of compressed air to atmosphere.

CLAIMS

- 120 1. A device for raising a supplementary dead axle of a commercial vehicle, of the type in which fluid suspension springs are interposed between the supplementary axle and the chassis of the vehicle, wherein mechanical springs which act in the sense of raising the supplementary axle are also interposed between the supplementary axle and the chassis, and wherein the fluid springs have associated pressure release means for allowing the mechanical springs to raise the axle, and pressurise-
- 125 130

ing means for lowering the axle against the action of the mechanical springs.

2. A device as claimed in Claim 1, wherein the mechanical springs are leaf springs.

5 3. A device as claimed in Claim 1 or Claim 2, wherein the fluid suspension springs are air springs.

10 4. A device as claimed in Claim 3, wherein the pressure release means and pressurising means comprise a three-way valve connecting the air springs selectively to a source of compressed air and to atmosphere.

15 5. A device for theraising of a supplementary dead axle of a commercial vehicle, substantially as herein described with reference to, and as shown in, the accompanying drawings.

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FIG. 1

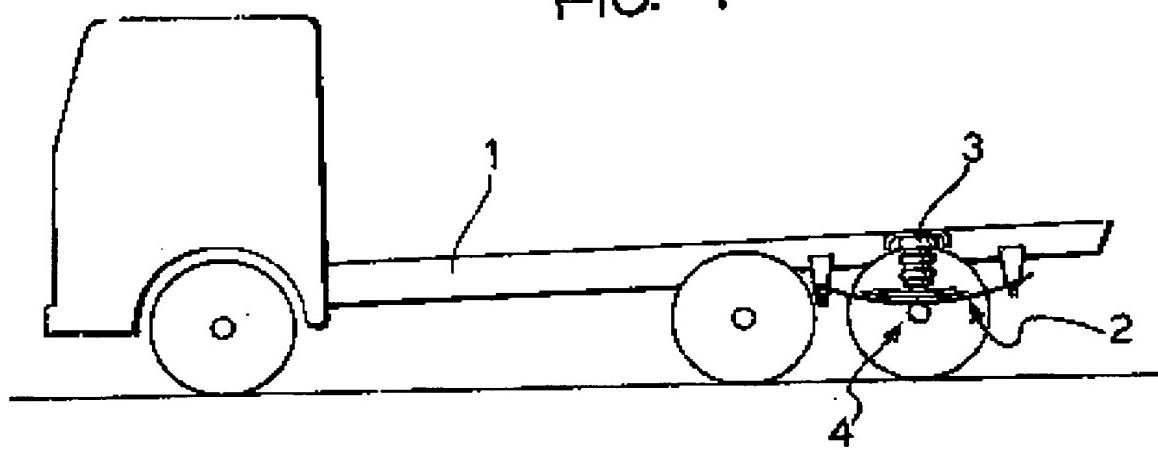


FIG. 2

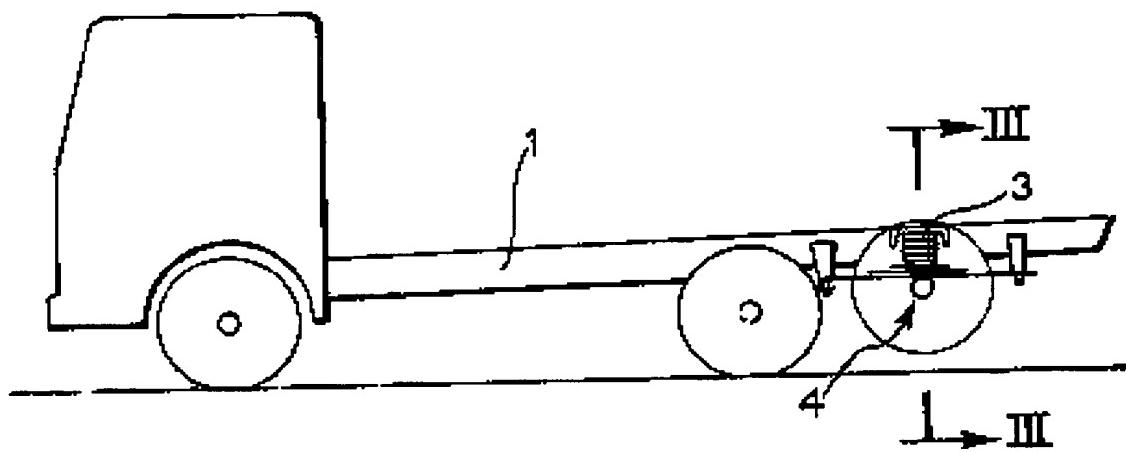
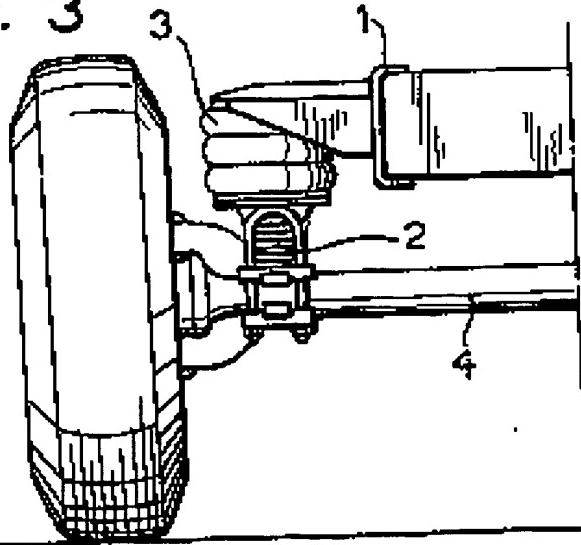


FIG. 3



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